Child Outcomes When Child Care Center Classes Meet Recommended Standards for Quality

NICHD Early Child Care Research Network

ABSTRACT

Objectives. This study assessed outcomes for children when child care centers meet recommended care standards.

Methods. Data from the NICHD Study of Early Child Care were used to examine the association between meeting standards for child–staff ratios, group sizes, caregiver training, and caregiver education and children's development at 24 and 36 months of age.

Results. There were 5 major findings: (1) most classes observed did not meet all 4 recommended standards (compliance ranged from 10% at 6 months of age to 34% at 36 months of age); (2) linear associations were found between number of standards met and child outcomes, and this was more the case at 36 months than at 24 months of age; (3) there was no evidence of threshold effects; (4) children in classes that met more standards had better school readiness and language comprehension scores as well as fewer behavior problems at 36 months of age; and (5) child outcomes were predicted by child–staff ratio at 24 months and caregiver training and education at 36 months of age.

Conclusions. Outcomes were better when children attended classes that met recommended child–staff ratios and recommended levels of caregiver training and education. (*Am J Public Health.* 1999;89:1072–1077)

This report focuses on a single basic question: Do children perform better in terms of cognition, language, and social competence when they receive child care that meets professional standards for quality? Although all 50 states regulate child care centers, there is considerable variability in the stringency of regulated standards. For example, mandated child–staff ratios range from 3:1 to 12:1 for infants and from 7:1 to 17:1 for 3-year-olds.[1] In those states that regulate group size, standards for infants permit from 6 to 20 infants in a group. Standards for caregiver training range from no formal training to a college degree. At least one study has found that none of the 50 states currently meet a variety of standards for infant and toddler care with respect to group composition (child–staff ratio and group size) and caregiver training (general education and specialized training).[2]

Previous research has provided evidence that standards might be important for children's well-being and development.[3–8] Lower child–staff ratios, smaller group sizes, and higher levels of caregiver education and training have each been found to be associated with higher scores on measures of children's development. Stronger effects are typically found when these features are analyzed jointly. For example, children's adjustment in kindergarten has been shown to be significantly related to a composite measure consisting of child–staff ratio, group size, caregiver training, and physical space.[9]

A number of professional organizations have provided child care recommendations in an effort to set national standards to safeguard the well-being of children. The American Public Health Association and the American Academy of Pediatrics joined forces in 1992 to formulate a comprehensive set of standards, resulting in the publication of a comprehensive and detailed manual for child care workers. The view of health reflected in the standards is broader than a biomedical model.[10] From a systems theory perspective, child care is seen as an environment that provides opportunities for sensitive caregiving, nutrition, safety, and learning. Data are needed with which to evaluate the effectiveness of these standards in regard to children's development.

The National Institute of Child Health and Human Development (NICHD) Study of Early Child Care provided an opportunity to examine the consequences for children when centers meet recommended standards in child care. This longitudinal study, begun in 1991, is an ecological investigation of children enrolled in the study at birth, independent of parents' plans for child care. A cohort of 1364 children from diverse social and ethnic backgrounds was identified in 9 states and assessed at multiple ages in multiple settings, including home and child care. Mirroring national statistics, most of the families in the study used some form of nonmaternal care beginning in the first year of the infant's life. Approximately 80% of the infants in the study experienced some regular nonmaternal child care during their first year.[11] The percentages of children enrolled in child care centers—the focus of this report—were as follows: 12% at 6 months, 17% at 15 months, 25% at 24 months, and 38% at 36 months of age. We predicted that children enrolled in child care center classes that met more professionally recommended standards would perform better on measures of cognition, language, and social competence than children enrolled in classes that met fewer of these standards.

Requests for reprints should be sent to NICHD Early Child Care Research Network, CHDB, National Institute of Child Health and Human Development, Bldg 61 E, 4B05, 9000 Rockville Pike, Bethesda, MD 20892.

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TABLE 1—Descriptive Statistics for Standards of Child Care at Each Age Assessed: NICHD Study of Early Child Care

Feature	No.	Mean	SD	Minimum	Maximum	Recommended Level	Classes Meeting Recommended Level, %
			6 months				
Child–staff ratio	97	4.26	2.31	0.81	15.06	3	36
Observed group size	97	7.86	4.05	1.63	30.13	6	35
Caregiver training	97	1.70	1.55	0.00	4.00	2	56
Caregiver education	97	2.97	1.07	1.00	6.00	3	65
			15 months				
Child–staff ratio	118	4.14	1.30	1.50	7.88	3	20
Observed group size	118	8.53	3.28	2.38	23.38	6	25
Caregiver training	118	1.64	1.38	0.00	4.00	2	60
Caregiver education	118	2.89	0.89	1.00	5.00	3	69
			24 months				
Child–staff ratio	163	5.22	1.70	1.68	10.95	4	26
Observed group size	163	10.66	4.78	3.38	37.75	8	28
Caregiver training	163	1.84	1.37	0.00	4.00	2	65
Caregiver education	163	3.06	0.86	1.00	5.00	3	77
			36 months				
Child–staff ratio	250	6.98	2.32	1.92	14.90	7	56
Observed group size	250	13.20	4.63	3.50	32.63	14	63
Caregiver training	250	2.10	1.33	0.00	4.00	2	75
Caregiver education	250	3.24	0.91	1.00	6.00	3	80

Note. Ratios and group sizes are averages based on a minimum of 6 observations.

Methods

Participants

Families participating in the study were recruited through hospital visits to mothers shortly after the birth of a child in 1991. Families lived in or near Little Rock, Ark; Irvine, Calif; Lawrence, Kan; Boston, Mass; Philadelphia, Pa; Pittsburgh, Pa; Charlottesville, Va; Morganton, NC; Seattle, Wash; and Madison, Wis. There were 3 phases of enrollment. First, of the 8986 families that experienced a birth during the sampling period, 5416 (60%) met the eligibility requirements (mother healthy, older than 18 years, and conversant in English; child healthy, singleton, and not adopted; family not planning to move, residing in neighborhood not extremely unsafe, living within 1 hour of research site [university], and not participating in another study); 130 mothers refused to be interviewed in the hospital (1%) and 308 refused to be contacted again (3%).

Second, 3015 families (56% of those eligible) were invited to participate in the study. Mothers from the eligible pool were called according to a conditional random sampling plan that ensured that the recruited families reflected economic, educational, and ethnic diversity. Third, of the 3015 families called, 1526 (51%) agreed to participate. There were various reasons why certain families could not participate (60 babies were in the hospital for 7 or more days, 91 families were planning to move, 512 families could not be contacted, 641 families refused, and 185 families had other reasons). Of the 1526 families that agreed to participate, 1364 (89%) completed the 1-month visit. Of the 1364 families that began the study, 1216 (89%) continued through 36 months. Only those children who were enrolled in child care centers (and for whom we also had relevant family and child outcome data) were included in the data described here (sample sizes were 97 at 6 months, 118 at 15 months, 163 at 24 months, and 250 at 36 months of age).

Measures

Child care variables. Children were observed in their child care centers at 6, 15, 24, and 36 months of age. Observations were conducted on 2 half-day visits scheduled within a 2-week interval at each of these ages. At each visit, observers completed two 44-minute cycles of the Observational Record of the Caregiving Environment, an instrument developed for this study to assess characteristics of care for an individual child.[12] After the second day's observations had been completed, the caregiver with whom the child spent the most time during the observation cycle was interviewed to obtain information about education and training.

Child–staff ratios were recorded by child care observers at the beginning and end of each observation cycle, and subsequently the average child–staff ratio across cycles was calculated. All adults were counted (qualified staff included caregivers, assistant caregivers, and aides who worked in classes at least 10 hours per week). Group size was calculated as the average number of children younger than 13 years across all observation cycles. Caregivers' formal training was scored from the interview to reflect training in child development or early childhood education in one of the following categories: none (scored as 0), high school courses (1), vocational/technical school courses (2), college courses (3), or college degree (4). Caregivers' education was scored as a 6-level variable (1 = less than high school graduation, 6 = advanced degree).

To create an index of the extent to which a class met the standards recommended by experts, we used child–staff ratio, group size, and training requirements published by the American Public Health Association and the American Academy of Pediatrics.[13] We selected these standards because they were specific, recent, and issued by 2 important professional organizations. The standards were as follows: child–staff ratios of 3:1 at 6 and 15 months, 4:1 at 24 months, and 7:1 at 36 months of age; group sizes of 6 at 6 and 15 months, 8 at 24 months, and 14 at 36 months of age; and formal, post–high school training (including certification or a college degree) in child development, early childhood education, or a related field at all 4 ages. Because higher education has been shown to be a predictor of better practice in numerous studies,[8,14,15] we supplemented the preceding standards with an additional one:

TABLE 2—Adjusted Means for Children in Settings That Did or Did Not Meet Specific Child Care Standards: NICHD Study of Early Child Care

	Child–Staff Ratio		Group Size		Caregiver Education		Caregiver Training	
	Met	Not Met	Met	Not Met	Met	Not Met	Met	Not Met
24 months								
No.	43	120	45	118	38	125	57	106
Mental development								
Mean	99.26	95.82	97.87	96.29	97.00	95.84	97.63	95.06
SE	1.78	1.06	1.75	1.08	1.06	1.96	1.14	1.57
Behavior problems								
Mean	*–1.54*	*0.07***	–0.09	–0.15	–0.30	–0.55	–0.51	–0.07
SE	0.50	0.30	0.50	0.31	0.30	0.56	0.33	0.45
Positive social behavior								
Mean	*0.79*	*0.13**	0.47	0.24	0.33	0.20	0.39	0.15
SE	0.24	0.14	0.24	0.15	0.14	0.27	0.16	0.21
36 months								
No.	140	110	157	93	201	49	187	63
School readiness								
Mean	49.77	47.12	49.23	47.56	*51.06*	*38.52****	*51.09*	*41.22***
SE	1.92	2.17	1.82	2.37	1.57	3.19	1.64	2.82
Expressive language								
Mean	99.96	97.60	99.60	97.77	99.63	96.01	99.40	97.48
SE	1.11	1.25	1.05	1.37	0.92	1.88	0.96	1.66
Language comprehension								
Mean	103.81	101.02	103.21	101.52	*103.50*	*98.81**	*104.03*	*98.27***
SE	1.07	1.21	1.02	1.33	0.89	1.81	0.92	1.58
Behavior problems								
Mean	*–0.66*	*0.57***	–0.32	0.23	*–0.51*	*1.49****	*–0.41*	*0.76**
SE	0.30	0.34	0.29	0.37	0.25	0.50	0.26	0.45
Positive social behavior								
Mean	*0.31*	*–0.16**	0.11	0.09	0.13	0.01	0.11	0.09
SE	0.14	0.16	0.13	0.17	0.12	0.24	0.12	0.21

Note. At 36 months, the ratio standard was 7.1, the group size standard was 14, the caregiver education standard was some college, and the caregiver training standard was some post–high school training in child development, early childhood education, or a related field. Pairs of means shown in italics were significantly different from one another. Child outcomes and child care standards were measured concurrently.
*$P<.05$; **$P<.01$; ***$P<.001$.

caregiver general education that included at least some college. Each class observed received a score of 0 or 1 on each of the 4 features of child care to signify whether it met the recommended standard; classes also received a total score for the number of recommended standards they met (from 0 to 4).

Family variables. Five family variables were included as potential covariates: (1) ratio of income to needs, calculated as total family income divided by poverty threshold for family size, averaged over the 4 assessment points (6, 15, 24, and 36 months of age), (2) maternal education, (3) concurrent single-parent status, (4) child gender, and (5) maternal sensitivity, as assessed by mother–child interaction ratings made during semistructured play.[16]

Child outcome variables. At 24 months of age, the Bayley II Mental Development Index[17] was administered to assess children's overall cognitive development. At 36 months of age, 51 items constituting the school readiness composite (colors, letter identification, numbers/counting, comparisons, and shapes) of the Bracken Basic Concept Scales were administered,[18] and total scores were converted to percentiles. The Reynell Developmental Language Scales, which consist of two 67-item instruments measuring language comprehension and expressive language, were also administered at 36 months of age,[19] and total scores were converted to standard scores (mean = 100, SD = 15). Prior to the beginning of data collection, testers were trained and certified in regard to all of these measures at a central location.

Mothers' reports of their children's problem behavior and positive social behavior were obtained at both 24 and 36 months of age via 2 instruments: the Child Behavior Checklist,[20] on which mothers rated how characteristic each of the 99 listed behaviors was of their child over the previous 2 months (0 = not true, 1 = sometimes true, 2 = very true), and the Adaptive Social Behavior Inventory,[21] on which mothers rated 30 descriptions of the child's behavior via 3-point scales representing frequency of occurrence (1 = rarely, 2 = sometimes, 3 = always). Four scales from the Child Behavior Checklist (externalizing, internalizing, sleep problems, and somatic problems) and the disruptive behavior scale of the Adaptive Social Behavior Inventory were standardized (mean = 0, SD = 1) and summed as a composite index of mother-reported behavior problems. The 2 remaining subscales from the Adaptive Social Behavior Inventory (expressive and comply) were standardized and summed as mother-reported positive social behavior.

Data analysis plan. First, the 9 study states were compared with the other states with respect to the 4 child care standards; *t* tests were used to determine representativeness. Second, descriptive statistics for the 4 features were computed. Third, multivariate analyses of covariance (MANCOVAs) were conducted to determine whether meeting suggested standards was related to child outcomes. Separate MANCOVAs were conducted for each feature on outcomes at each age. Finally, the extent to which number of standards met was related to child outcomes was examined (via MANCOVAs). Number of standards met was treated as a 5-level categorical variable, and a linear trend analysis tested the extent to which children in classes that met more standards tended to perform better than children in classes that met fewer standards.

TABLE 3—Linear Trends Relating Number of Recommended Standards Met to Child Outcomes: NICHD Study of Early Child Care

	Adjusted Mean by No. of Standards Met					Linear Trend	
	0	1	2	3	4	F	P
24 months							
No.	15	38	65	29	16		
Mental development, mean (SE)	95.4 (3.0)	93.8 (1.9)	97.2 (1.5)	98.6 (2.2)	99.7 (3.0)	2.19	.14
Behavior problems, mean (SE)	0.34 (0.86)	–0.12 (0.54)	–0.19 (0.41)	–0.40 (0.62)	–2.17 (0.84)	4.18	.04
Positive social behavior, mean (SE)	0.31 (0.41)	–0.02 (0.26)	0.16 (0.20)	0.74 (0.30)	0.86 (0.40)	2.25	.14
36 months							
No.	8	31	65	60	86		
School readiness, mean (SE)	36.1 (8.0)	38.9 (4.1)	47.9 (2.8)	51.5 (2.9)	51.8 (2.4)	6.29	.01
Expressive language, mean (SE)	92.3 (4.7)	98.6 (2.4)	95.8 (1.6)	101.4 (1.7)	100.2 (1.4)	3.34	.07
Language comprehension, mean (SE)	95.6 (4.5)	99.1 (2.3)	100.1 (1.6)	105.0 (1.6)	104.7 (1.4)	6.03	.02
Behavior problems, mean (SE)	2.69 (1.25)	0.81 (0.63)	0.31 (0.43)	0.04 (0.45)	–1.14 (0.38)	9.59	<.01
Positive social behavior, mean (SE)	–0.14 (0.60)	0.06 (0.30)	–0.10 (0.21)	0.14 (0.22)	0.27 (0.18)	0.47	.49

Note. Family income-to-needs ratio and maternal sensitivity were used as covariates.

Results

To determine the representativeness of the 9 study states with respect to the 4 child care standards, we used existing state-level data for the 50 states and the District of Columbia on mandated child–staff ratios, group sizes, caregiver formal training, and caregiver education at 9 and 30 months, the 2 ages for which data were available.[1,22] Four *t* tests were conducted comparing ratio and group size between the 9 study states and the remaining 41 states and the District of Columbia at both ages. Two χ^2 tests were performed comparing the proportion of states meeting American Public Health Association standards for caregiver education and training in the 9 study states vs the remaining states. All tests were nonsignificant; thus, there is no evidence of bias in the selection of the 9 states.

Descriptive statistics for the 4 features in the observed centers are presented in Table 1. At the 3 youngest ages, the average observed child–staff ratio exceeded the recommended level by 1 child per adult; specifically, the average observed child–staff ratios were 4:1 (vs the recommended 3:1) at 6 and 15 months and 5:1 (vs 4:1) at 24 months of age. At 36 months of age, the observed child–staff ratio was equivalent to the recommended ratio (7:1). The average observed group size also exceeded the recommended level at 6 and 15 months (8 children vs the recommendation of 6) and at 24 months of age (11 children vs 8), whereas, at 36 months, it approximately met the recommended standard (observed group size: 13; recommended maximum group size: 14). The average observed levels of caregiver formal training and education approximated the levels we set as guidelines in our analyses at all 4 ages. The majority of caregivers had some formal, post–high school training in child development or early childhood education and at least some college education.

The total number of recommended standards met increased as the children became older. Only 10% to 12% of the classes observed met all 4 standards at 6, 15, and 24 months, whereas 34% of the classes met all 4 at 36 months of age. Nearly 20% of the classes failed to meet any of the recommended standards at the 2 youngest ages, while only 3% of the classes failed to meet any at the oldest age.

Five family variables (ratio of income to needs, maternal education, single-parent status, child gender, and maternal sensitivity) known to relate to both families' child care selection and children's development were examined for possible inclusion in analyses as covariates. At 24 months of age, 2 of the 5 family variables were associated with the number of recommended standards met by child care centers: ratio of income to needs ($F_{4,158}=2.91$, $P<.03$) and maternal education ($F_{4,158}=6.84$, $P<.001$). Predictably, these variables were lowest in centers that met no standards.

At 36 months of age, only maternal sensitivity was associated with number of standards met ($F_{4,245}=3.47$, $P<.01$); this variable also was lowest in centers that met no standards. Because maternal education and ratio of income to needs were highly correlated at both 24 and 36 months of age, we decided to include one of these variables as a covariate. We selected ratio of income to needs because it was less correlated with maternal sensitivity and thereby provided a more independent control. (Analyses were also rerun with maternal education replacing ratio of income to needs as a covariate; a similar pattern of results was obtained.) Thus, we included 2 covariates in all further analyses: ratio of income to needs and maternal sensitivity.

When we conducted separate MANCOVAs (for each of the 4 features) to compare children in classes that met a given standard with children in classes that did not, results indicated that concurrent child outcomes differed significantly as a function of the standards for child–staff ratio at 24 months ($F_{3,157}=3.61$, $P=.015$), caregiver education at 36 months ($F_{5,242}=4.94$, $P=.0002$), and caregiver training at 36 months of age ($F_{5,242}=3.74$, $P=.003$). Adjusted means and univariate comparisons are displayed in Table 2. Meeting the recommended ratio standard was associated with fewer behavior problems and more cooperative behaviors at 24 months of age. Meeting standards for caregiver education and training was associated with higher school readiness and language comprehension scores and fewer behavior problems at 36 months of age.

In the next step, we examined the associations between the number of standards classes met and child outcomes. The multivariate test of the linear trend was not significant at 24 months of age; however, 1 of the 3 univariate tests was significant. Fewer behavior problems were reported for children in classes that met more standards. At 36 months of age, the multivariate test of the linear trend was significant ($F_{5,239}=3.26$, $P=.007$), and the univariate linear contrasts were significant for 3 of the 5 outcomes. Children in classes that met more recommended standards displayed higher school readiness and language comprehension scores and fewer behavior problems (see Table 3).

Effect sizes were computed as the average change in an outcome associated with a 1-point increase in the number of standards met, divided by the estimated standard deviation

(under the analysis model). Average change was estimated from the group means based on the assumption that number of standards and outcome measures were linearly related. These analyses indicated that increasing the number of standards met by 1 was associated with modest amounts of change: decreases on the behavior problems composite of 0.53 points at 24 months of age (effect size: 0.16) and 0.84 points at 36 months of age (effect size: 0.24) and increases of 4.40 percentile points on the 36-month school readiness score (effect size: 0.20) and 2.41 points on the language comprehension standard score (effect size: 0.19).

In a set of post hoc analyses, we examined contrasts for possible thresholds in the linear trends. All were significant: 0 or 1 vs 2 to 4 standards met ($F_{5,239}=3.62$, $P=.004$), 0 to 2 vs 3 or 4 standards met ($F_{5,239}=4.08$, $P=.004$), and 0 to 3 vs 4 standards met ($F_{5,239}=4.23$, $P=.001$). Because all contrasts were significant, there did not appear to be any threshold; instead, analyses at 36 months of age consistently indicated that when children attended classes that met more standards, their cognitive, language, and social development was better than when they attended classes meeting fewer standards.

The analyses described thus far focused on the concurrent effects of child care standards on child outcomes (i.e., both measured at the same point in time). In a final set of analyses, lagged effects were examined. For the 87 children in center-based care at both 15 and 24 months of age, 24-month outcomes were predicted from the number of standards met at 15 months of age; for the 127 children in center-based care at both 24 and 36 months of age, 36-month outcomes were predicted by number of standards met at 24 months of age. In neither case were there significant lagged effects. Note that the associations between number of standards met at consecutive ages were moderate ($r = .35$ between 15 and 24 months and $r = .34$ between 24 and 36 months of age).

Discussion

This report began with the question of whether children have better outcomes when they attend centers where classes meet more professional standards for child–staff ratio, group size, caregiver training, and caregiver education. The answer to this question depends on a child's age, the outcome, and the specific child care standard. Outcomes were better when children attended classes that met the recommended child–staff ratio at 24 months and the recommended levels of caregiver training and education at 36 months. Furthermore, the more standards met, the better the outcomes in terms of school readiness, language comprehension, and behavior problems at 36 months. These results complement previous findings from the NICHD Study of Early Child Care showing significant associations between observed child care quality (i.e., caregiver behavior with children) and children's cognitive, language, and social outcomes.[11,23] Beyond this general statement, the data raise a number of issues that deserve further comment.

First, classes for older children were more likely to meet the recommended standards than were classes for infants and toddlers. Three times as many classes for 3-year-olds met the recommended standards as classes for children younger than 3 years. Does this mean that the quality of care is better for older children than for younger children, or is it simply that the recommended standards for older children are easier to follow? It is certainly true that the recommended standards for ratios and group sizes at 36 months of age are more affordable than the standards at younger ages. It appears that this is not the complete explanation, however, because the levels of caregiver training and education were also higher in older children's classes. Apparently, in terms of these 4 child care features and the recommended standards set by experts, the center-based care received by preschoolers in this sample was better than the care provided to infants and toddlers. Regardless, it is important to highlight the failure of most centers in this sample to meet standards at younger ages, especially standards regarding child–staff ratio and group size.

A related issue concerns the fact that associations between the 4 features and child outcomes were stronger at 36 months than at 24 months of age. It may be that variations in child care environments are less important at the younger age. On the other hand, it is important to note that child outcomes cannot be measured in identical ways and with identical reliabilities at different ages and that our power to detect associations increased with age as the sample size increased. Any of these factors could explain why there were more statistically significant associations at 36 months of age. Available data from the National Longitudinal Survey of Youth also have shown that the associations between child outcomes and features of care are stronger for preschoolers (3–5 years of age) than for younger children (birth–2 years of age) (D. Blau, unpublished data, 1997). When the data we have collected on the NICHD-study children at older ages are analyzed, we will learn more about the consistency of age differences in the links between standards and child outcomes.

A third issue is whether there is a critical cutoff point with regard to the recommended standards; that is, if a class meets 1 or 2 or 3 recommendations, is this as good as meeting all 4? The answer to this question seems to be no: the more recommendations followed, the better children performed.

Another question of interest is whether following more recommended standards is associated with better outcomes or failing to follow recommendations is associated with poorer outcomes. Although the constraints of our naturalistic research design made it impossible to determine unequivocally the direction of effects between child care parameters and child outcomes, differences between the population norms and adjusted means in the extreme groups (i.e., classes that met none of the recommended standards and classes that met all of them) were examined to address this question. The mean school readiness percentile scores were 36.1 (about 14 percentiles below the population norm of 50) for children in classes meeting none of the recommendations and 51.8 (approximately average) for children in classes meeting all of them. For language comprehension, there was evidence that not meeting any recommended standards was related to lower than average scores (mean = 95.6), whereas meeting all of them was associated with above-average scores (mean = 104.7). The behavior problems measure included 2 scores with population norms, the Child Behavior Checklist externalizing and internalizing scales. Separate analyses of covariance conducted for the 2 scales revealed that children in classes not meeting any recommendations had more problems of both kinds than the norming population at 36 months of age, whereas children in classes meeting all recommendations scored at the mean for this population at both 24 and 36 months of age.

To understand the social significance of these findings, it is helpful to ask how many children were in classes whose failure to meet recommendations was associated with below-average performance. Below-average school readiness was observed for children in classes that met fewer than 2 recommendations (16% of the sample); below-average language comprehension was observed for children in classes that met none of the recommendations (3% of the sample); and more behavior problems than average were observed for children in classes meeting no recommendations at 24 months (9% of the sample) and fewer than 3 recommendations at 36 months of age (42% of the sample).

A final issue concerns the size of identified associations; that is, how substantial were

differences in children's performance that were associated with whether their classes met recommended standards. The effect sizes were modest, as has been the case in child care research generally.[24] As the study continues, and children are assessed at 54 months of age and then again in the first grade, we will learn whether these differences observed at 36 months of age presage long-lasting outcomes of attending child care centers that meet or fail to meet the standards recommended by professional organizations. In the meantime, these data should be added to the growing research literature[2–6] documenting relations between child care standards and developmental outcomes for children.

These relations between child care standards and children's development raise important issues for policymakers. The concurrent analyses suggest that the failure of many states to impose stringent standards and the failure of many centers to meet such standards may undermine children's development. The fact that 24% of the classes observed at 24 months were not in compliance with their state's group size standard, with noncompliance in some states running as high as 60%, leads one to wonder whether current policies and enforcement practices actually place some children at risk. If so, these findings support a policy of more stringent child care regulation, including adoption of national standards. Some, however, might question the return on investment that might result from the added cost of raising standards, because the lagged analyses, which admittedly lacked the statistical power of the concurrent analyses, failed to reveal significant effects. Clearly, more work in this important area is needed; the NICHD Study of Early Child Care will continue to monitor concurrent and lagged effects as the children grow older. □

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References

1. Azure SL. *Child:Staff Ratios and Group Size Requirements in Child Care Licensing: A Comparison of 1989 and 1996.* Boston, Mass: Center for Career Development in Early Care and Education, Wheelock College; 1996.
2. Young KT, Marsland KW, Zigler E. The regulatory status of center-based infant and toddler child care. *Am J Orthopsychiatry.* 1997;67:535–544.
3. Burchinal MR, Roberts JE, Nabors LA, Bryant DM. Quality of center child care and infant cognitive and language development. *Child Dev.* 1996;67:606–620.
4. Clarke-Stewart KA, Gruber CP, Fitzgerald LM. *Children at Home and in Day Care.* Hillsdale, NJ: Lawrence Erlbaum Associates; 1994.
5. Dunn L. Ratio and group size in day care programs. *Child Youth Care Forum.* 1993;22:193–226.
6. Phillips DA, Howes C, Whitebook M. The social policy context of child care: effects on quality. *Am J Community Psychol.* 1992;20:25–51.
7. Ruopp R, Travers J, Glantz F, Coelen C. *Children at the Center.* Cambridge, Mass: Abt; 1979.
8. Howes C. Children's experiences in center-based child care as a function of caregiver background and adult:child ratio. *Merrill-Palmer Q.* 1997;43:404–425.
9. Howes C. Can the age of entry into child care and the quality of child care predict adjustment in kindergarten? *Dev Psychol.* 1990;26:292–303.
10. Ford DH, Lerner RM. *Developmental System Theory: An Integrative Approach.* Newbury Park, Calif: Sage Publications; 1992.
11. NICHD Early Child Care Research Network. Child care in the first year of life. *Merrill-Palmer Q.* 1997;43:340–360.
12. NICHD Early Child Care Research Network. Characteristics of infant child care: factors contributing to positive caregiving. *Early Child Res Q.* 1996;11:269–306.
13. *Caring for Our Children: National Health and Safety Performance Standards: Standards for Out-of-Home Child Care Programs.* Ann Arbor, Mich: American Public Health Association, American Academy of Pediatrics; 1992.
14. Berk LE. Relationship of caregiver education to child-oriented attitudes, job satisfaction, and behaviors toward children. *Child Care Q.* 1985;14:103–129.
15. Whitebook M, Howes C, Phillips D. *Who Cares? Child Care Caregivers and Quality Care in America: Final Report of the National Child Care Staffing Study.* Oakland, Calif: Child Care Employee Project; 1990.
16. NICHD Early Child Care Research Network. The effects of infant child care on infant-mother attachment security: results of the NICHD Study of Early Child Care. *Child Dev.* 1997;68:860–879.
17. Bayley N. *Bayley II Scales of Infant Development.* New York, NY: Psychological Corp; 1993.
18. Bracken BA. *Bracken Basic Concept Scales.* San Antonio, Tex: Psychological Corp; 1984.
19. Reynell J. *Reynell Developmental Language Scales (U.S. Edition).* Los Angeles, Calif: Western Psychological Services; 1991.
20. Achenbach TM, Edelbrock C, Howell CT. Empirically based assessment of behavioral/emotional problems of 2- and 3-year-old children. *J Abnorm Child Psychol.* 1987;15:629–650.
21. Hogan A, Scott KG, Bauer C. The Adaptive Social Behavior Inventory (ASBI): a new assessment of social competence in high risk three-year-olds. *J Psychoeducational Assess.* 1992;10:230–239.
22. Azure SL, Eldred D. *Training Requirements in Child Care Licensing Regulations.* Boston, Mass: Center for Career Development in Early Care and Education, Wheelock College; 1997.
23. NICHD Early Child Care Research Network. Early child care and self-control, compliance, and problem behavior at 24 and 36 months. *Child Dev.* 1998;69:1145–1170.
24. Scarr S, Eisenberg M. Child care research: issues, perspectives, and results. *Annu Rev Psychol.* 1993;44:613–644.